

WHAT IS CLAIMED IS:

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1. An ink-jet recording head comprising:
an elastic sheet providing pressure generating chambers;
nozzle orifices, each communicating with the pressure generating chamber;
piezoelectric vibrators formed on the elastic sheet, each of the piezoelectric vibrators having,
a lower electrode formed on the elastic sheet,
a piezoelectric layer formed on the lower electrode, and
an upper electrode formed on the piezoelectric layer such that the upper electrode faces the respective pressure generating chamber, wherein the upper electrodes of the piezoelectric vibrators are positioned independently of each other;
an electrical insulator layer having windows, wherein the electrical insulator layer covers the upper electrodes; and
a conductor pattern connecting with the upper electrodes via the windows of the electrical insulator layer.
2. The ink-jet recording head according to claim 1, wherein the conductor pattern is formed in a position opposite corresponding to portion walls between the pressure generating chambers and connected to more than one site of each of the upper electrodes via windows.

A 3. The ink-jet recording head according to claim 1, wherein the windows extend to a peripheral edge of each of the piezoelectric layers such that the windows do not interfere with the displacement of the vibrating region of the piezoelectric layer.

A 4. The ink-jet recording head according to claim 1, wherein the ~~electrical~~ insulator layer is made of either one of a silicon oxide, a silicon nitride and an organic material.

A 5. The ink-jet recording head according to claim 4, wherein the ~~electrical~~ insulator layer is made of a polyimide.

A 6. An ink-jet recording head according to claim 1, wherein the ~~electrical~~ insulator layer is formed of an etchant resistant film which is used as a protective film at etching.

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A 7. An ink-jet recording head comprising:
an elastic sheet providing pressure generating chambers;
nozzle orifices, each communicating with the pressure generating chamber;
piezoelectric vibrators formed on the elastic sheet, each of the piezoelectric vibrators having,
a lower electrode formed on the elastic sheet,

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a piezoelectric layer formed on the lower electrode, and

an upper electrode formed on the piezoelectric layer such that the upper electrode faces the respective pressure generating chamber, wherein the piezoelectric layer and the upper electrodes are formed inside of the areas facing the respective pressure generating chamber;

an electrical insulator layer having windows, wherein the electrical insulator layer covers the upper electrodes; and

a conductor pattern connecting with the upper electrodes via the windows of the electrical insulator layer.

8. The ink-jet recording head according to claim 7, wherein the conductor pattern is formed in a position opposite corresponding to portion walls between the pressure generating chambers and connected to more than one site of each of the upper electrodes via windows.

A 9. The ink-jet recording head according to claim 7, wherein the windows extend to a peripheral edge of each of the piezoelectric layers such that the windows do not interfere with the displacement of the vibrating region of the piezoelectric layer.

A 10. The ink-jet recording head according to claim 7,
wherein the ~~electrical~~ insulator layer is made of either one of
a silicon oxide, a silicon nitride and an organic material.

A 11. The ink-jet recording head according to claim 10,
wherein the ~~electrical~~ insulator layer is made of a polyimide.

12. An ink-jet recording head according to claim 7,
wherein the ~~electrical~~ insulator layer is formed of an etchant
resistant film which is used as a protective film at etching.